Metal Samples
Corrosion Monitoring Systems

MS2540 Current Loop Receiver with RS485 Communication User Manual

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SECTION 1 – INSTALLATION

Shipping and Receiving 4
Mounting 5
Electrical 6
Physical Dimensions 7
Specifications 9
Equipment Safety 10

SECTION 2 – START-UP AND OPERATION

Start-Up Procedure 11
Receiver Start-Up 11
Operation 12
Controls Operation 14
Title Screen 14
Main Screen 15
Setup Screen 17
Data Chart Screen 19
Status Screen 20
Option Settings Screen 22
Calibration Screen 23
Help Screen 24

SECTION 3 – MAINTENANCE

General Preventive Maintenance 25
Service Instructions 25
Fuse Replacement 26

SECTION 4– TROUBLESHOOTING

Trouble Procedures 27

NOTICE

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1. INSTALLATION

SHIPPING AND RECEIVING

Equipment is carefully prepared for shipment to protect it during transit and to enable the user to install it with a minimum amount of reassembly.

Upon receipt, equipment should be carefully inspected for transit damage. If damage is apparent, notify Metal Samples and the carrier for claims inspection.

UNLOADING AND LIFTING

Open the package as remove the instrument carefully. The instrument contains a display screen, while removing utmost care to be given to the display.

CLEANING

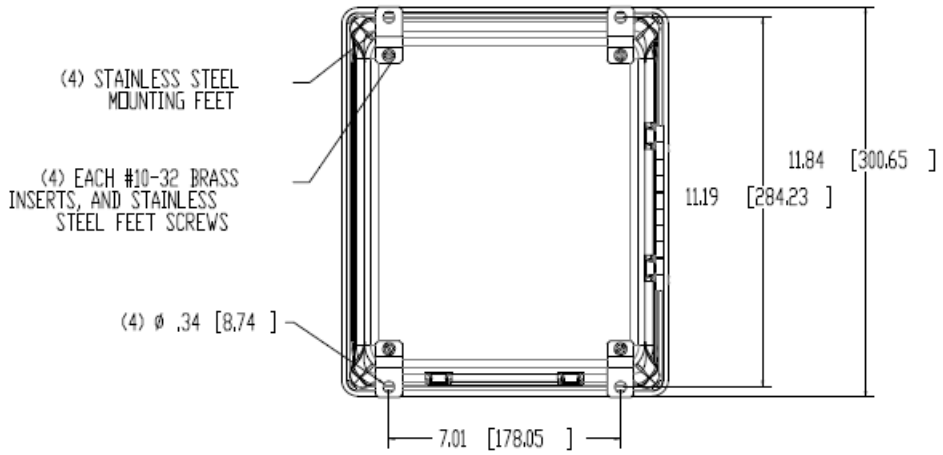
Clean the equipment thoroughly to remove any foreign material that may have accumulated during shipment.

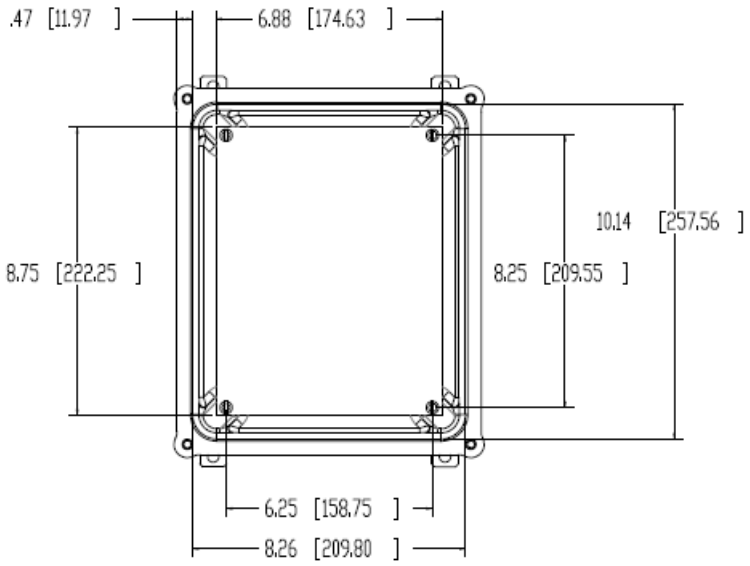
INSTALLATION

Place the receiver instrument in a convenient location, preferably away from heat producing sources or direct sunlight.

Receiver supplied for wall mounting and it can Place the receiver instrument in a convenient location, preferably away from heat producing sources or direct sunlight.

MOUNTING


(4) STAINLESS STEEL MOUNTING FEET
(4) EACH #10-32 BRASS INSERTS, AND STAINLESS STEEL FEET SCREWS
(4) ø .34 [8.74]
11.84 [300.65]
11.19 [284.23]
7.01 [178.05]

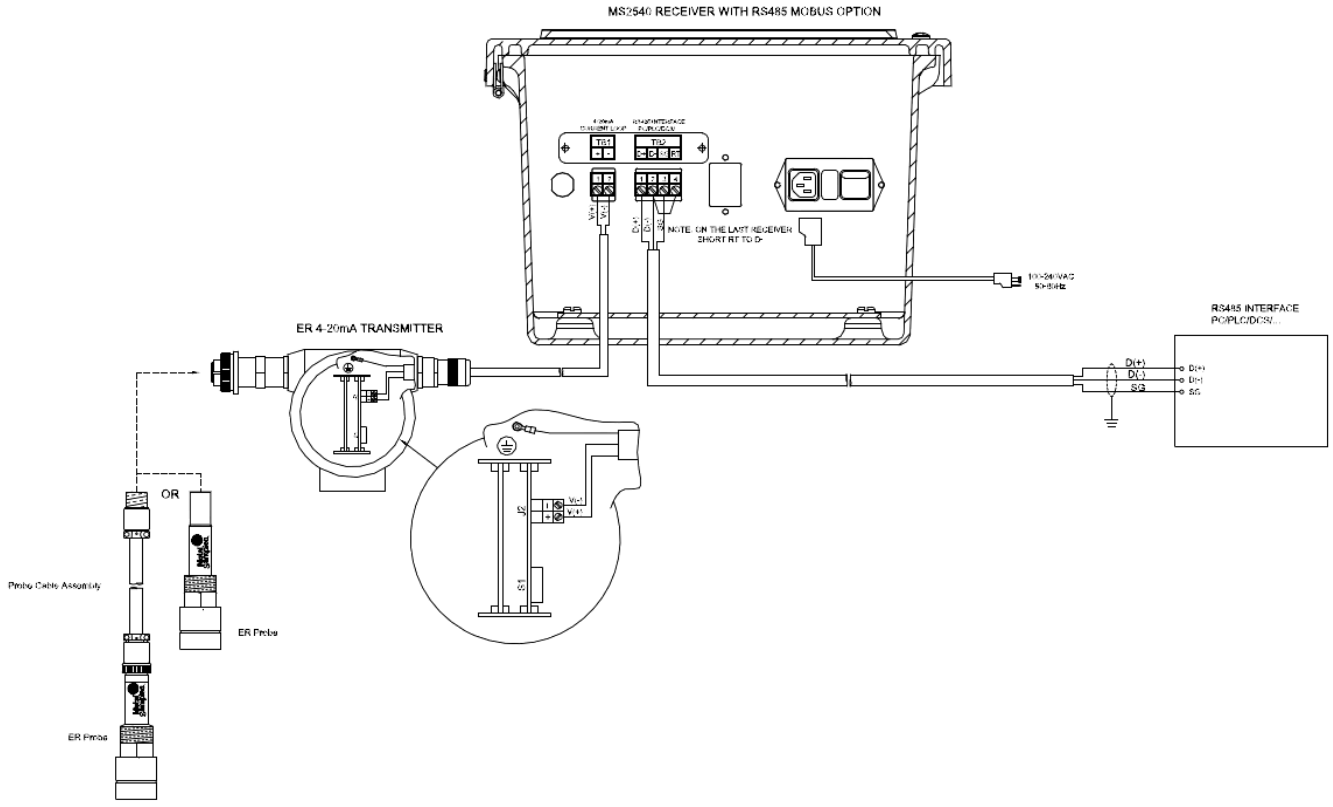

.47 [11.97]
6.88 [174.63]
10.14 [257.56]
8.75 [222.25]
8.25 [209.55]
6.25 [158.75]
8.26 [209.80]

ELECTRICAL

Main Power Connection

Connect Single Phase, 100- 240V AC, 50/60 Hz to the plug provided in the bottom of the unit. The maximum current requirement is 2 A.

Note: In some cases, the instrument is shipped without a connector on the power cord. Each locality should inspect the power cord and install the proper connector if necessary. The connector should be installed in a properly grounded outlet for proper over current and earth fault protection.



Transmitter Connections

1. Connect '+' Ve terminal of the transmitter to the TB1-1 (+) terminal.
2. Connect '-' Ve terminal of the transmitter to the TB1-2 (-) terminal.

RS485 Connections

1. Connect ‘D +’ of the DCS / PLC to the TB2-1 (D+) terminal.
2. Connect ‘D -‘ of the DCS / PLC to the TB2-2 (D-) terminal.
3. Connect Signal Ground of the DCS / PLC to the TB2-3 (SG) terminal
4. Connect Terminating Resistor terminal.

Ethernet Connections

Connect the unit using Straight RJ45 cable to the Ethernet switch or Router, if you are connecting to the Personnel Computer use Crossover RJ45 cable. Before connecting it to the local network please contact your network administrator for proper IP address configuration of the equipment .

Warning

Duplicated IP address may cause network failure at the installation site; Consult Network Administrator.

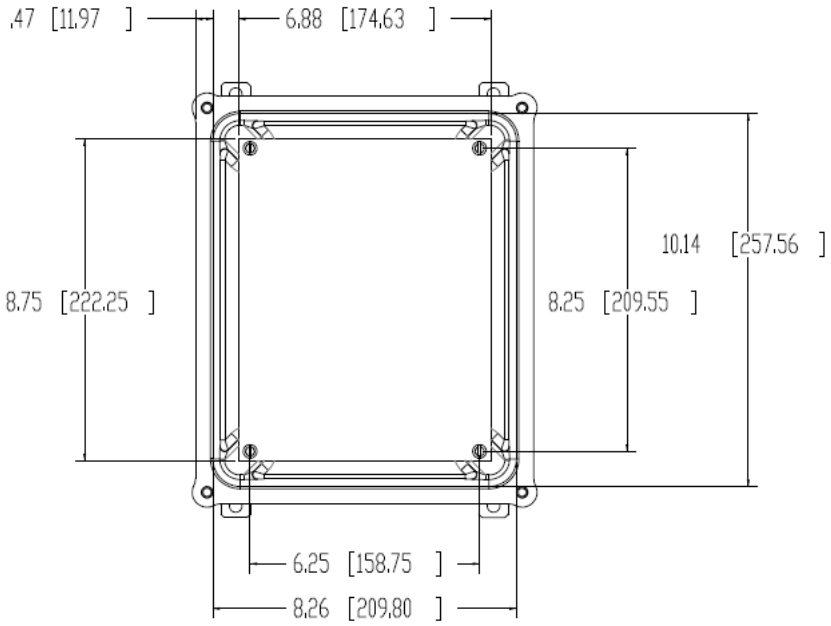
ADJUSTMENTS

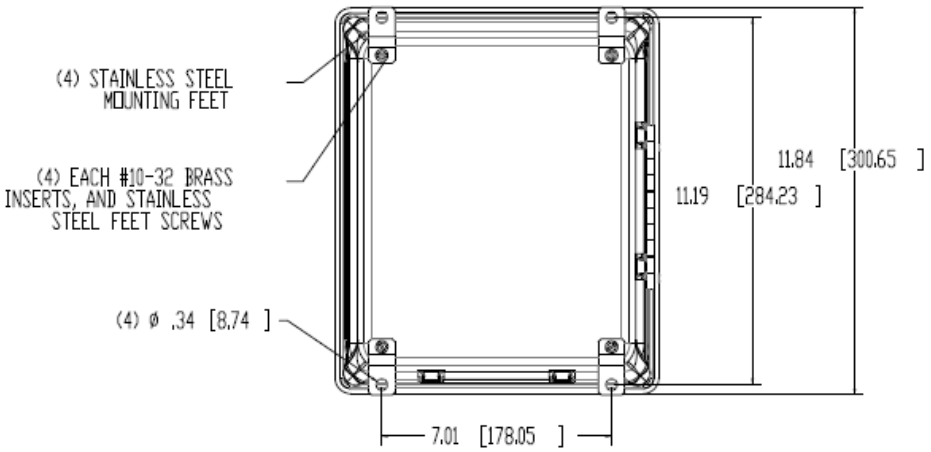
Receiver functions must be adjusted and operated only by those authorized personnel who have read and who thoroughly understand the descriptions of the various control functions presented in this manual.

STORAGE AND INSTALLATION ENVOIRNMENT

Protect the receiver instrument from mechanical stress, humidity, dust and thermal damage. Storage temperature is -20 C to + 60 C. operating temperature is+15 C to +35 C.

PHYSICAL DIMENSIONS

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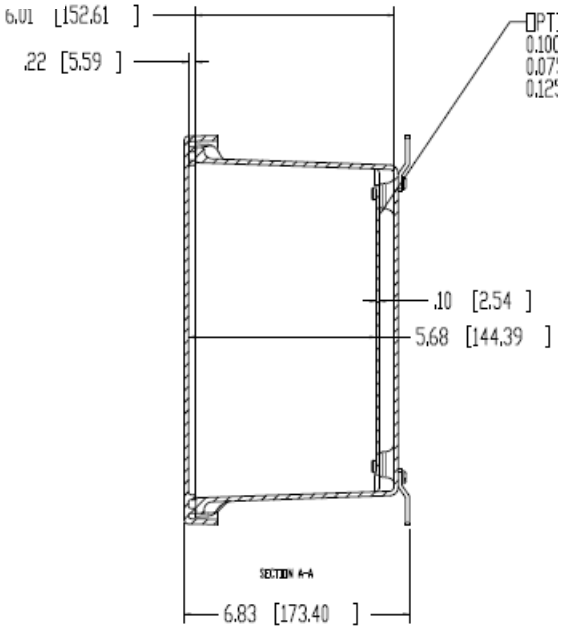


SPECIFICATIONS

WEIGHT	-	~4 lbs (~1.9 Kg)
DIMENSIONS	-	8.25” X 11.84” X 6.83” (20.98cm X 30.00cm X 17.34cm)
MOUNTING	-	Panel Mount
OPERATING TEMP:	-	32^{o} F to 122^{o} F (0^{o} C to 50^{o} C)
POWER SUPPLY		
Voltage	-	100 – 240 V, 1 phase, 50/60 Hz
Current	-	< 2 Amps
SIGNAL		
Voltage	-	24V Dc
Current loop	-	4 – 20 mA
Input Impedance	-	250 Ohms
COMMUNICATION		
Type	-	RS485 (Serial)
Protocol	-	MODBUS
No. Of Units	-	32 units (maximum)

NETWORK

Use Cross over cable to connect the equipment directly to PC

Use Straight Cable to connect to the network switch, router …

EQUIPMENT SAFETY

Always follow these warnings and safety procedures:

Before attempting to operate or perform any service functions, all operators and service personnel should read this manual to become familiar with the complete operation of the Equipment. Becoming familiar with all operating procedures will greatly reduce the possibility of accidents or injury.

ONLY QUALIFIED OPERATORS AND MAINTENANCE PERSONNEL THAT HAVE COMPLETE AND CORRECT KNOWLEDGE OF THE RECEIVER INSTRUMENT SHOULD PERFORM ALL OPERATIONS AND MAINTENANCE PROCEDURES.

1. POTENTIAL HAZARDS.

A. Electrical

!!DANGER!!

Do not touch electrically live components. Before performing any maintenance procedures, make sure that the main switch, located on the bottom of the instrument enclosure in the "OFF" position .

Receiver Instrument must be properly grounded, failure to do so will result an electrical result.
Damaged electrical connections or wires should be replaced before power is applied.
All covers must remain securely in place when power is applied or electrical shock may result.

Always follow these electrical system safety procedures:

- Follow proper plant, regional and national safety procedures while servicing the electrical systems on this equipment.
- Remove all metal items, such as rings, metal necklaces and wrist watches. These are electrical hazards. Medical alert jewelry should be worn with caution.
- Use insulated tools when working on electrical equipment to reduce the possibility of shock.
- When troubleshooting with power activated, know the amount of voltage present in all areas before troubleshooting.
- Always use fuses of a smaller capacity than the safe capacity of the line or equipment it serves.

2. START UP & OPERATION

RECEIVER START-UP

If the Receiver is new one removed from the package or not had been used for an extended amount of time (overnight, weekend, or holiday), follow the procedure below to start the equipment:

1. Refer 'MS2540 Receiver connection Details' for detailed receiver connections to transmitter and DCS/PLC/PC.
2. Ensure the transmitter connections are connected properly to the receiver unit.
3. Ensure the DCS /PLC/ PC is connections to the receiver.
4. Ensure the power cord is connected and power is turned on. The mains switch is located under the equipment. The Green light start illuminates once the switch is on.
5. If receiver is turned on after a long time, follow step 7.
6. When the power is turned on, the equipment boots up and Receiver title page appears for a short time and probe initialization message appears on the screen. Also Probe Initialization message appears on the screen if the equipment lost the probe life data setting or if the during the program update.

   PROBE INITIALIZATION MESSAGE

   Pressing 'OK' on the message takes the display to Options Settings page, you may enter the right probe life using the pop up keyboard on the screen. Refer Options Page details for detailed settings. (PAGE : 24)
7. When the power is turned on, the equipment boots up and Receiver title page appears for a short time and probe initialization message appears on the screen if the unit is a new one; the display changes to main page which shows the Metal loss and corrosion rate display, if the equipment is turned on after a long time.
8. After approximately a minute the display updates the current metal loss value.
9. Check and ensure the Probe life data on the Settings page, if requires change the probe life according the probe connected.

OPERATION

The model MS2540 is a line powered current loop receiver that provides 24V DC to power a 2 wire 4-20 mA instrument loop, and provides a display of the loop value in metal loss and calculated corrosion rate and also the device can be connected to the DCS/PLC/PC via RS485 Serial Communication.
The corrosion rate time period can be set with different intervals of 48 hours, 7 Days, 15 Days and 30 Days. The Corrosion rate is calculated using a simplified algorithm that calculates every 30 minutes based on the metal loss change over the previous 48 hours to 30 days according to the setting.
The metal loss values are stored in the compact flash card with time stamp value. The same can be used for metal loss analysis at any given time.

Universally acceptable MODBUS protocol is used for RS485 serial communication hence no special software is required to communicate to the receiver. Also up to 32 receivers can be connected to DCS/PLC/PC via Daisy chain. The Modbus data can be easily accessible real time.

The built-in web server also can be used to monitor the display on the remote computer thru' network.

Output

The Metal loss is calculated using one of the following formulas.

Metal Loss (mils) = $(I_L - 4 / 16)$ X Probe life

Metal Loss (mm) = $(I_L - 4 / 16)$ X Probe life X 25.4

Where:
I_L = Loop Current in mA

ProbeLife = Usable portion of probe element thickness in mils (See Table-1)

TABLE 1 : PROBE LIFE AND ELEMENT ID

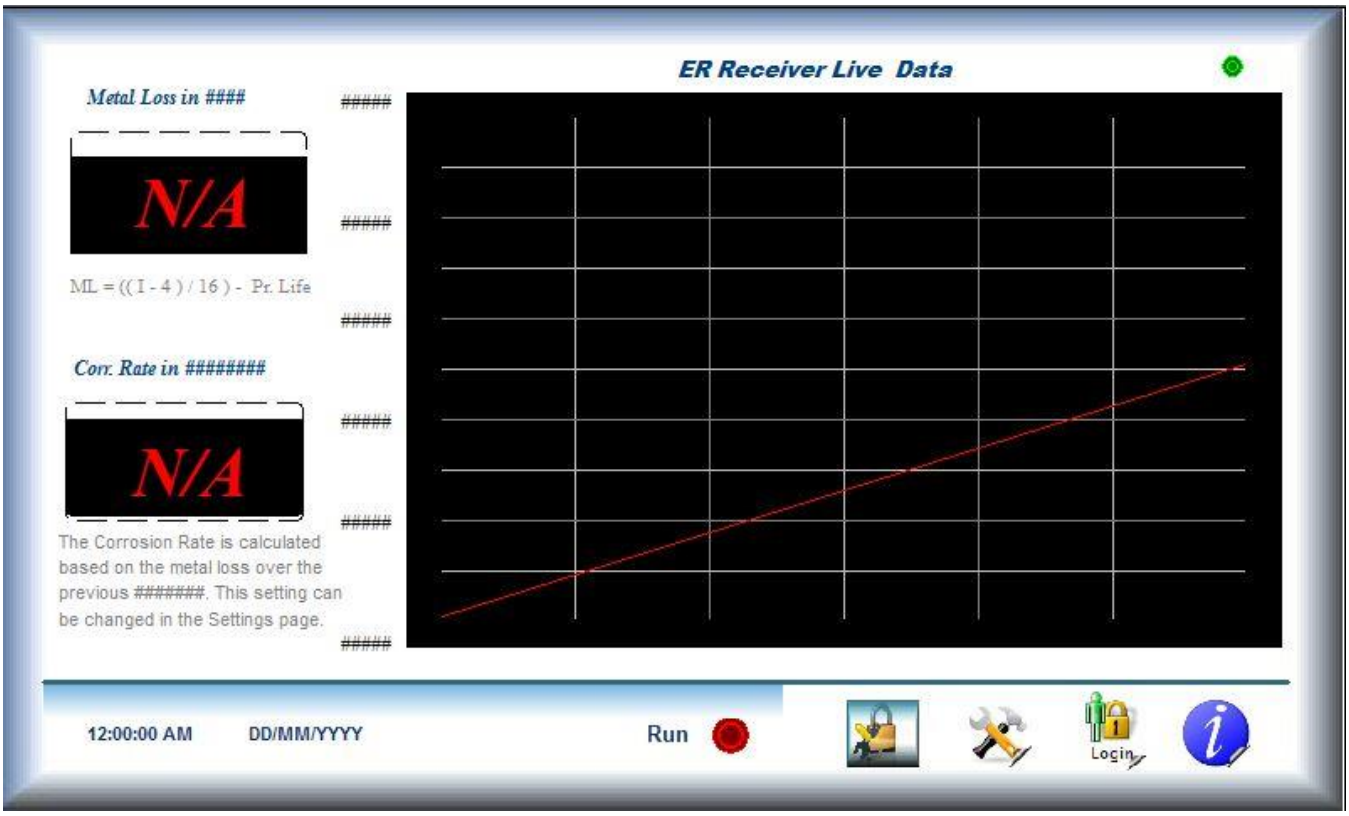
Element Type	Element Thickness	Probe Life	Element Identifier
Wire Loop	40 mil	10 mil	WR 40
	80 mil	20 mil	WR 80
Tube Loop	4 mil	2 mil	TU 04
	8 mil	4 mil	TU 08
Strip Loop	4 mil	1 mil	SL 04
	8 mil	2 mil	SL 08
Cylindrical	10 mil	5 mil	CT 10
	20 mil	10 mil	CT 20
	50 mil	25 mil	CT 50
Spiral Loop	10 mil	5 mil	SP 10
	20 mil	10 mil	SP 20
Flush(Small)	4 mil	2 mil	FS 04
	8 mil	4 mil	FS 08
	20 mil	10 mil	FS 20
Flush (Large)	10 mil	5 mil	FL 10
	20 mil	10 mil	FL 20
	40 mil	20 mil	FL 40
Surface Strip	10 mil	5 mil	SS 10
	20 mil	10 mil	SS 20
	40 mil	20 mil	SS 40

CONTROLS OPERATION

TITLE SCREEN

The Title screen is the first screen displayed when power is activated and after the equipment boots up..

MAIN SCREEN



METAL LOSS IN mils

Display indicates the active metal loss data in selected unit. (mils / micron).

CORR. RATE IN MILS / Yr

Display indicates the active Corrosion rate in selected unit (mils/microns) per year.
The corrosion rate is calculated based on the metal loss over the previous hours. Timing is settable thru' settings page.

First time after power on or probe change out the corrosion rate starts calculates after 48 hours and displays the value even the set value is other than 48 hours. If the set value is other than 48 hours once the set value time reached then it starts calculating the corrosion rate according to the set period.

LIVE DATA

This graph window displays the live data from the transmitter in metal loss value.

PAGE NAVIGATION BUTTONS

Press ‘Setup’ image button to display the ER / LPR Setup page.

Press ‘Status’ image button to display the Status page.

Press ‘Chart image button to display the Chart page.

Press ‘Information’ image button to display the Help page.

SETUP SCREEN

ER SETUP PAGE
Metal Loss in ####
N/A
ML = ((I - 4) / 16) - Pr. Life
Corr. Rate in ########
N/A
The Corrosion Rate is calculated based on the metal loss over the previous #######. This setting can be changed in the Settings page.
Display Unit
mils
Calculation Period
ListBox_Length
Authorised Personnel only !
Changing the Calculation Period may change the Corrosion rate.
Select the Probe Life according to the probe used.
Press the display unit button to change the display unit
Probe Life
Setting in mils
###.##
12:00:00 AM
DD/MM/YYYY
Run

DISPLAY UNIT

Press the 'Display unit' button to change the display units of the metal loss and corrosion rate as mils or microns on the main page.

CALCULATION PERIOD

This selection unit is for calculating the corrosion rate per year based on the set time. This can be selectable as 48 Hours, 7 days, 15 Days and 30 days.

PROBE LIFE

Set the Probe life according to the probe used on the field, this setting should be in mils.

METAL LOSS DISPLAY IN mils

Display indicates the active metal loss data in selected unit. (mils / micron).

CORR. RATE DISPLAY IN MILS / Yr

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PAGE NAVIGATION BUTTONS

Press 'Home' image button to display the Main page.

Press 'Status' image button to display the Status page.

Press 'Chart image button to display the Chart page.

Press 'Information' image button to display the Help page.

DATA CHART SCREEN

YEAR

Press the 'Year' entry box and enter the year for which the metal loss data needs to be displayed in the chart.

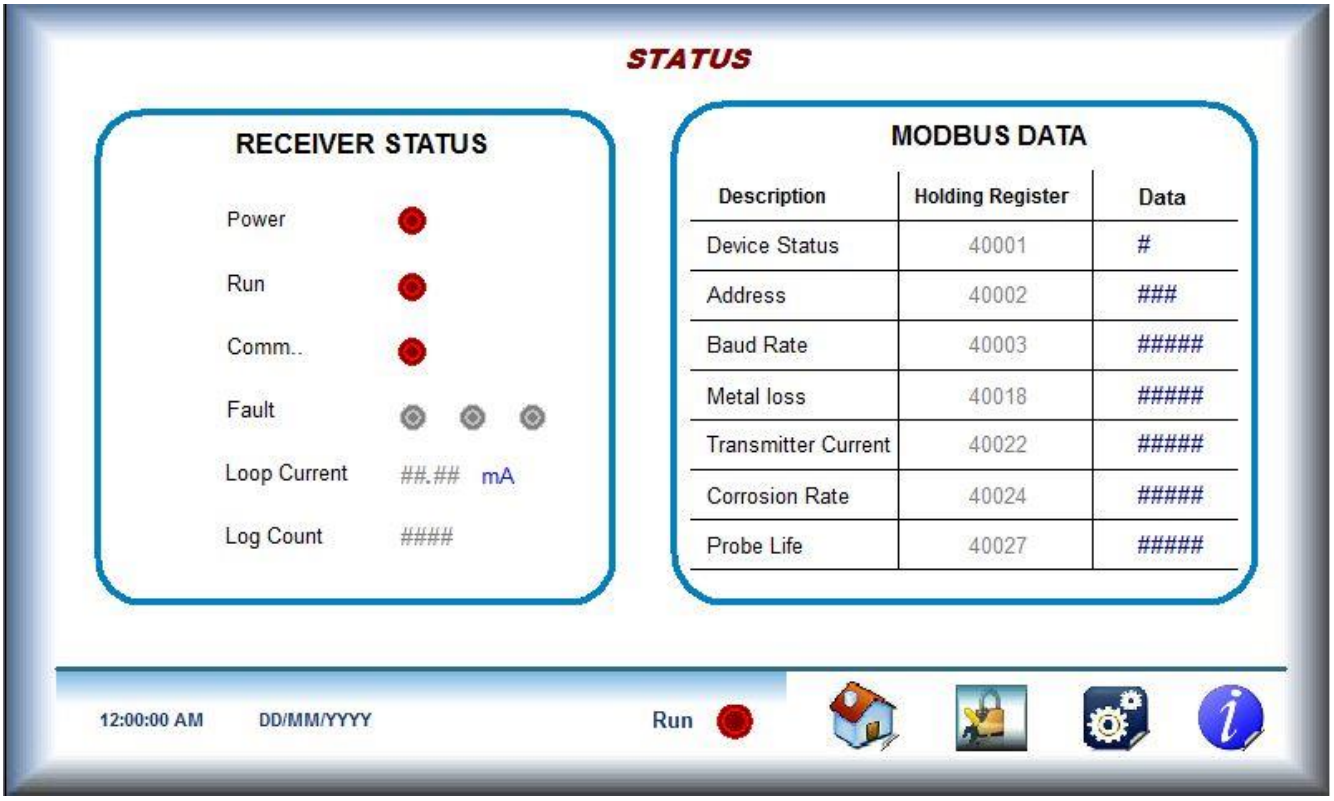
MONTH

Select the month to view the metal loss data for the respective month or select 'ALL' to view the data for whole year.

PAGE NAVIGATION BUTTONS

Press 'Home' image button to display the Main page

STATUS SCREEN



RECEIVER STATUS

Power - The Power light becomes green when the receiver power supply is in good condition.

Run - The Run light becomes green when the receiver is in run condition and the processor is acquiring the metal loss data.

Comm. - The Comm. Light becomes green when receiver communicates successfully to the transmitter.

Fault –

1. Fault light becomes Red when the hardware fault occurs.
2. Fault light becomes Red when interface I/O fault occurs
3. Fault light becomes Red when Software issues.

Loop Current – Displays the transmitter current.

Log Count – Displays the log count of the receiver loop current measurement. Minimum of 96 counts are necessary to display the corrosion rate display on the main page.

MODBUS DATA REGISTERS

Device Status (#40001) - The Modbus register data of the receiver status is displays here.

Address (#40002) - Displays the receiver address.

Baud Rate (#40003) - Displays the Baud Rate settings of the receiver.

Metal loss (#40018) - Fault light becomes Red when the fault occurs on the receiver unit.

Transmitter Current (#40022) - Displays the transmitter current.

Corrosion Rate (#40024) - Displays the corrosion rate.

Probe Life (#40027) - Displays the probe life data.

PAGE NAVIGATION BUTTONS

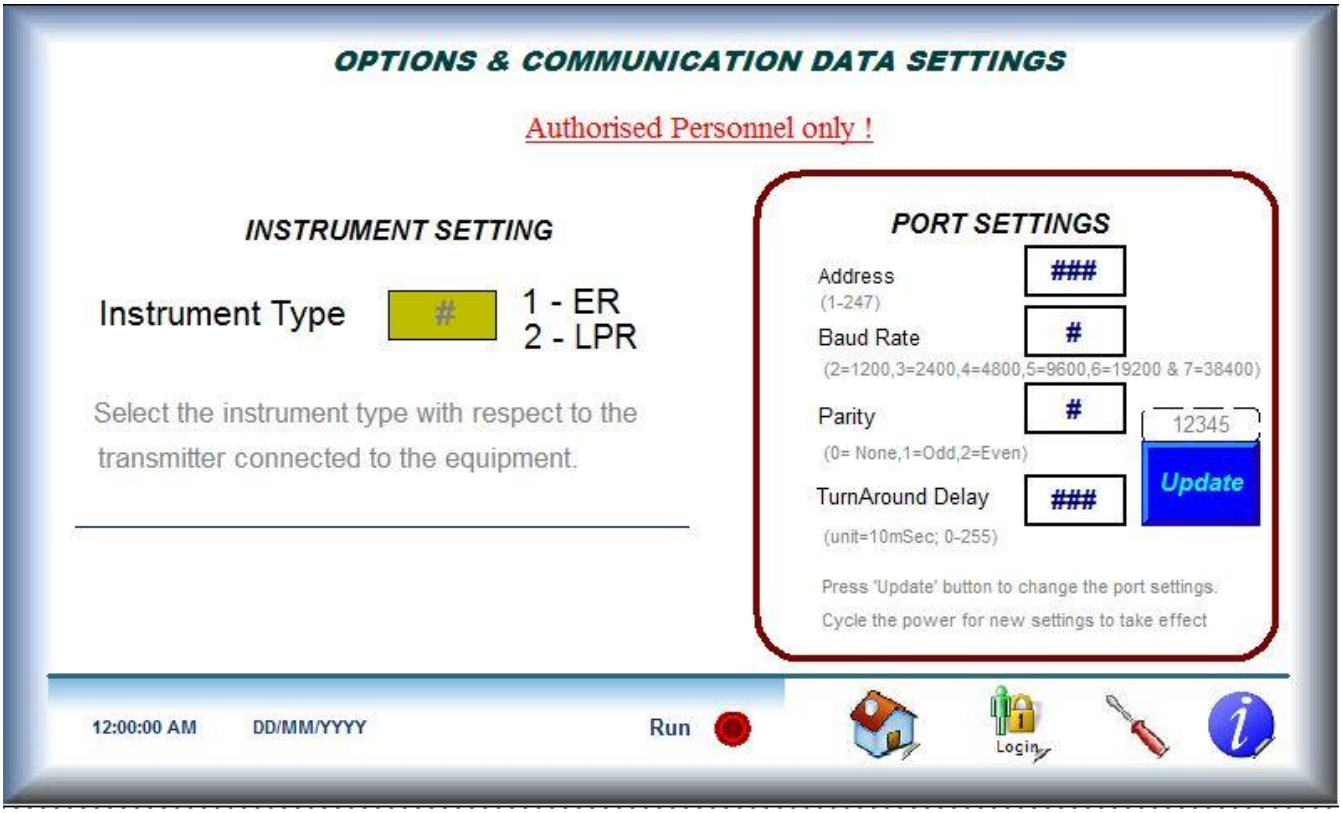
Press ‘Home’ image button to display the Main page

Press ‘Setup’ image button to display the ER / LPR Setup page.

Press ‘Options’ image button to display the Options page.

Press ‘Information’ image button to display the Help page.

OPTION SETTINGS SCREEN



INSTRUMENT SETTING

Follow the below steps to calibrate the receiver with respect to the transmitter current.

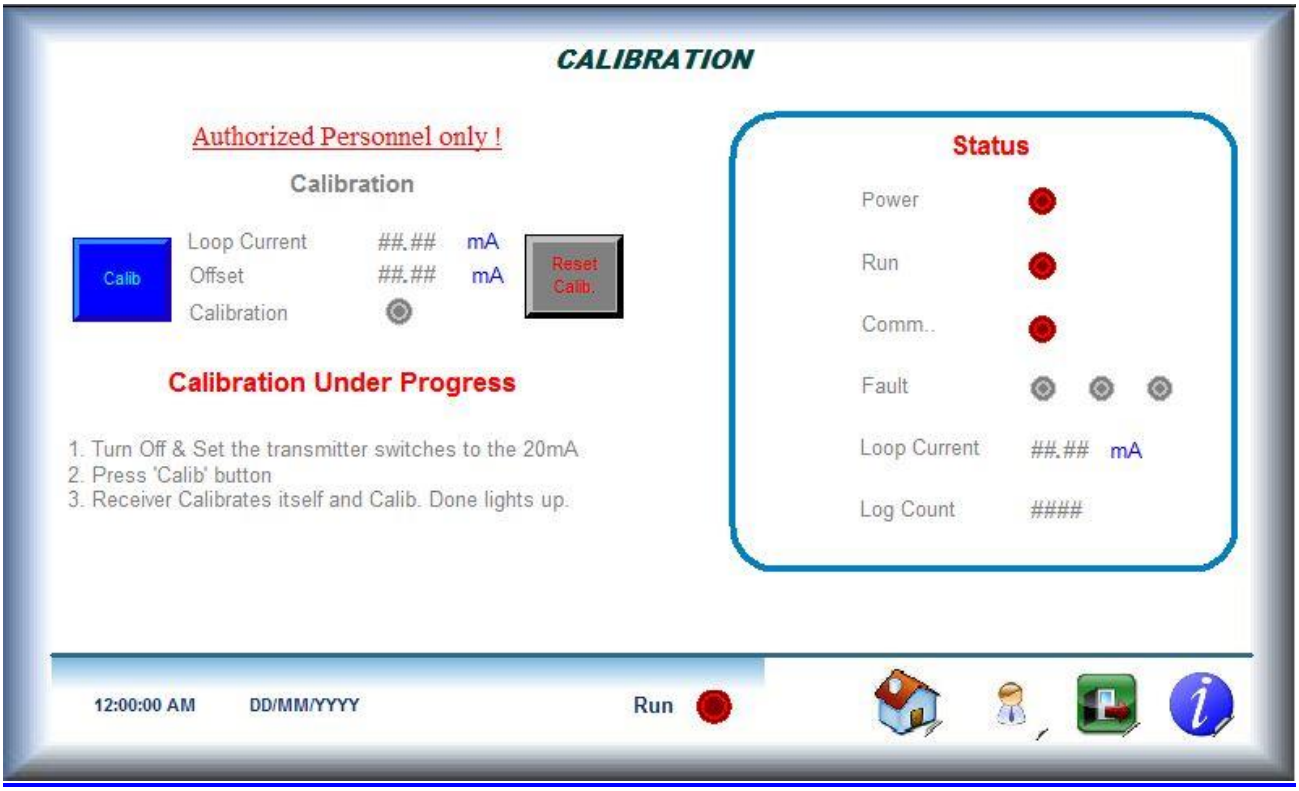
1. Turn off the receiver power and set the transmitter switches to 20mA.
2. Turn on the power.

PORT SETTINGS

Address	-	Enter the address for receiver (1 to 32)
Baud Rate	-	Enter the numerals respective to the Baud Rate for the RS 485 communication. (2→ 1200; 3→2400; 4→4800; 5→9600; 6→19200; & 7→382400)
Parity	-	Enter the Parity for RS485 communication. (0→ None; 1→Odd; & 2→Even)
Turnaround Delay	-	Enter the turnaround delay for communication..

Note : Recommended communication Settings (Baud Rate = 9600, Parity = Even, & Turn Around Delay = 10)

CALIBRATION SCREEN



CALIBRATION PROCEDURE

Follow the below steps to calibrate the receiver with respect to the transmitter current.

1. Turn off the receiver power and set the transmitter switches to 20mA.
2. Turn on the power.
3. Wait for a minute.
4. Press ‘Calib’ button on the above screen.
5. Receiver calibrates automatically and on completion of the calibration, the calibration light turns Green.

PAGE NAVIGATION BUTTONS

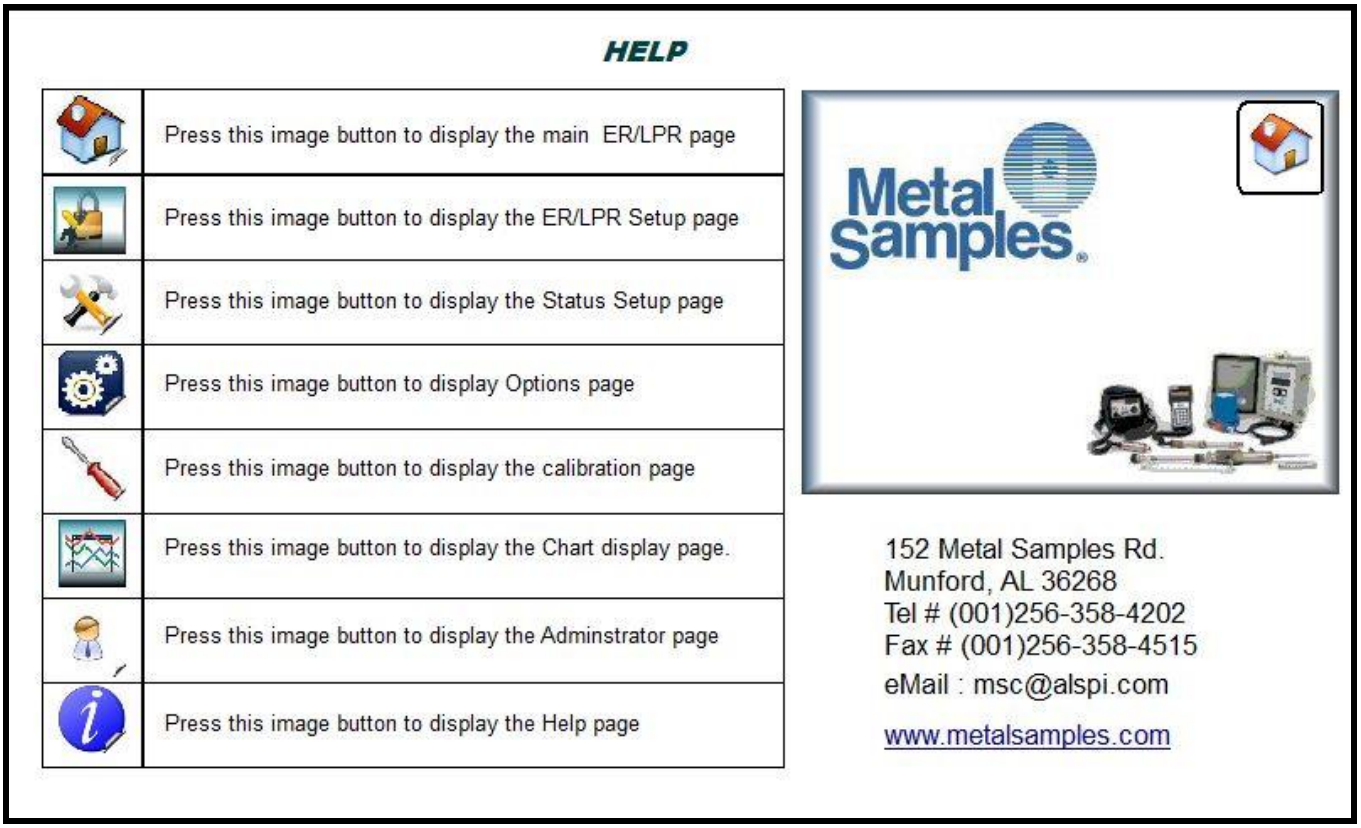
Press ‘Home’ image button to display the Main page.

Press ‘Admin’ image button to display the Administrator page. The Administrator login is necessary to enter.

Press ‘Logout’ image button to logout from user privileges.

Press ‘Information’ image button to display the Help page.

HELP SCREEN


HELP
Press this image button to display the main ER/LPR page
Press this image button to display the ER/LPR Setup page
Press this image button to display the Status Setup page
Press this image button to display Options page
Press this image button to display the calibration page
Press this image button to display the Chart display page.
Press this image button to display the Adminstrator page
Press this image button to display the Help page
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PAGE NAVIGATION BUTTONS

Press ‘Home’ button to display the Main page

3. MAINTENANCE

I. General/Preventative Maintenance

Only qualified service technicians should maintain and repair the equipment. Follow all local safety regulations while servicing.

1. Every 12 Months

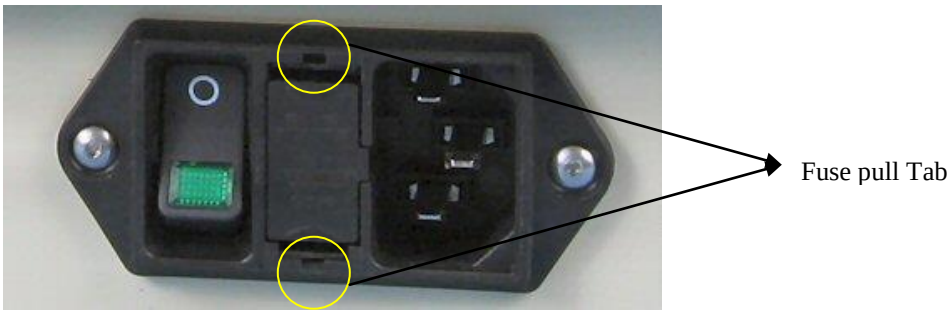
A. Check and tighten all electrical screw connections.

II. Service Instructions

A. Main Fuse Replacement (F1- 2A)

The mains fuse can be replaced by following the below mentioned procedure.

1) Turn off the main Power switch
2) Remove the Single Phase power cord connected to the equipment.

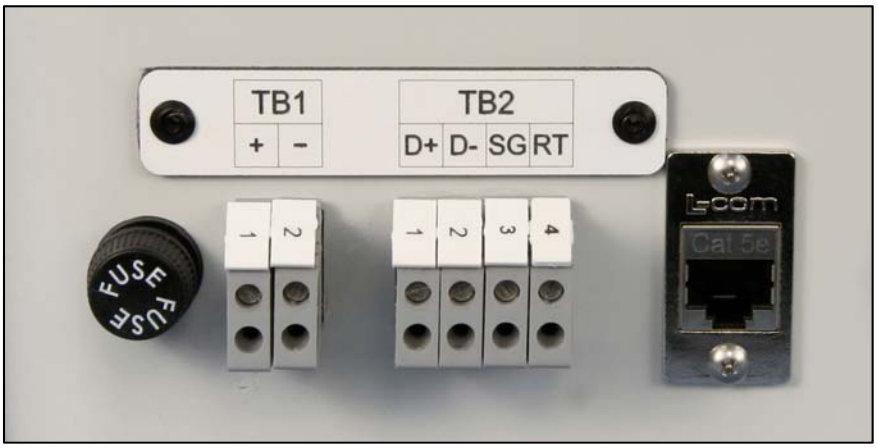


3) Using the small screwdriver or fuse drawer remover, push the tab shown in the above picture and pull the fuse drawer out. One spare fuse will be provided in the fuse drawer, you can discard the blown one and use the spare one and insert on its location. Press the fuse drawer inside and ensure it is properly locked in its position.

4) Connect the main cord and turn on the mains power.

B. Loop Current Fuse Replacement (F2 – 0.1A)

1) Turn off the main Power switch.
2) Remove the loop current fuse holder cap by rotating the fuse holder cap towards the left.
3) Remove the Glass fuse from the fuse holder.
4) Replace same type of fuse.
5) Insert the fuse holder knob and tighten fully.
6) Turn on the power.



4. TROUBLESHOOTING

Troubleshooting is the process of identifying a problem, finding the cause of the problem and performing the necessary steps to correct it.
Fault messages displayed on the status window to identify the location and type of fault that has occurred.

This troubleshooting section addresses common equipment problems, possible causes and recommended solutions.

IMPORTANT: It is not the intent of this manual to provide a highly detailed breakdown of all possible problems that may be encountered while using this equipment**.**

WARNING:

Contact equipment Distributor or Manufacturer for help, if a problem cannot be easily corrected.

PROBLEM	POSSIBLE CAUSE	SOLUTION
No Display	Power is not activated.	Check the mains supply and ensure the switch is in on position.
	Blown Fuse	Replace the fuse.
	Display defective	Contact Distributor/. Manufacturer
No Metal loss Value Display	Current loop wires loose	Check and connect properly the current loop wires.
	Current loop Wires polarity	Check the polarity of the connected current loop wires.
	24V missing	Check 24V on current loop wires Contact Distributor / Manufacturer.